



ACT
Government

SUBSURFACE DRAINAGE 031

MUNICIPAL
INFRASTRUCTURE
TECHNICAL
SPECIFICATION
03 - UNDERGROUND SERVICES

Transport Canberra and
City Services

July 2019



Publication Number:	MITS 03I Edition 1 Revision 0
---------------------	-------------------------------

Date of Effect:	July 2019
-----------------	-----------

Supersedes: Standard Specification for Urban Infrastructure Works Section 3
Edition 1 Revision 0 September 2002

Endorsed By:	Karl Cloos	Director, Infrastructure Planning
--------------	------------	-----------------------------------

Approved By: Ken Marshall Executive Branch Manager, Roads ACT

Document Information

Document	Key Information
----------	-----------------

Document Title MITS 03I Subsurface drainage

Next review date	
------------------	--

Key words

AUS-SPEC Base Document	1171 Subsurface drainage
------------------------	--------------------------

Revision Register

Edition/ Revision Number	Clause Number	Description of Revision	Authorised By	Date
--------------------------	---------------	-------------------------	---------------	------

1/0

--	--	--	--	--

CONTENTS

1 SUBSURFACE DRAINAGE..... 4

1.1 General 4

1.1.1 Cross references..... 4

1.1.2 Referenced documents 4

1.1.3 Standards 5

1.1.4 Interpretation..... 5

1.1.5 Hold points and witness points 6

1.2 Materials..... 7

1.2.1 Subsurface drainage pipes 7

1.2.2 Other types of subsurface drainage pipes 7

1.2.3 Filter material..... 7

1.2.4 Geotextile..... 11

1.3 Execution 12

1.3.1 Provision for traffic..... 12

1.3.2 Site establishment..... 12

1.3.3 Outlet structures 12

1.4 Completion 13

1.4.1 Submissions..... 13

2 MEASUREMENT AND PAYMENT13

2.1 Measurement 13

2.2 Pay items 14

LIST OF TABLES

Table 3I-1 Hold point table 6

Table 3I-2 Witness point table..... 6

Table 3I-3 Type A filter material table 8

Table 3I-4 Type B filter material table 8

Table 3I-5 Type B filter material variation table 8

Table 3I-6 Type C filter material table 9

Table 3I-7 Type D filter material table..... 9

Table 3I-8 Type E filter material table 10

Table 3I-9 No fines concrete filter material table..... 10

Table 3I-10 Pay items table..... 14

1 SUBSURFACE DRAINAGE

1.1 General

1.1.1 Cross references

General: The following documents are related to this Specification.

1.1.1.1 ACT Legislation

Road Transport (General) Act

Public Roads Act

Scaffolding and Lifts Act

Scaffolding and Lifts Regulation

Work Health and Safety Act

1.1.1.2 Specifications

Requirement: Conform to the following:

MITS 00	Preliminaries
MITS 01	Traffic Management
MITS 02	Earthworks
MITS 04	Flexible pavement construction
MITS 06	Concrete kerbs, paths and driveways
MITS 08	Incidental works
MITS 09	Landscape
MITS 10	Concrete works
MITS 16	WSUD Features

1.1.2 Referenced documents

1.1.2.1 Standards

General: The following documents are incorporated into this Specification by reference:

Australian standards

AS 1141	Methods for sampling and testing aggregates.
AS 1141.11.1	Particle size distribution by dry sieving.
AS 1141.22	Wet/dry strength variation.
AS 1289	Methods of testing soils for engineering purposes.
AS 1289.5.5.1	Soil compaction and density tests - Determination of the minimum and maximum dry density of a cohesionless material - Standard method.
AS 1289.5.6.1	Soil compaction and density tests - Compaction control test - Density index method for a cohesionless material
AS/NZS 1477	PVC pipes and fittings for pressure applications.

AS 2439	Perforated plastics drainage and effluent pipe and fittings.
AS 2439.1	Perforated drainage pipe and associated fittings.
AS 2758	Aggregates and rock for engineering purposes.
AS 2758.1	Concrete aggregates.
AS 3705	Geotextiles - Identification, marking and general data.
AS 3706	Geotextiles - Methods of test.
AS 3706.9	Determination of permittivity, permeability and flow rate.

Austrroads

AGPT	Austrroads Guide to Pavement Technology
AGPT04G	Part 4G: Geotextiles and geogrids
AGPT10	Part 10: Subsurface drainage

American Society for Testing and Materials

ASTM D2434-68	Standard Test method for permeability of granular soils (Constant head)
---------------	---

1.1.3 Standards

1.1.3.1 General

Standard: To *AGPT10*.

Proprietary products: To *TCCS Products previously considered for use list*

1.1.4 Interpretation

General: For the purposes of this Specification the following abbreviations apply:

TCCS: Transport Canberra and City Services, ACT Government and its successors.

1.1.4.1 Definitions

General: For the purpose of this Specification, the definitions of terms used to define the components of the road reserve are in conformance with *AS 1348, Glossary of Austrroads Terms* and *AGRD03*, the definitions given below also apply:

Subsurface drainage: Includes subsoil drains, foundation drains and drainage mats.

1.1.5 Hold points and witness points

1.1.5.1 Notice

General: Give written notice to the Authorised Person so that the documented inspection and submissions may be made to **Hold point table** and the **Witness point table**.

Table 3I-1 Hold point table

Item	Clause title	Requirement	Notice for inspection	Release by
Materials				
31.1	Subsurface drainage pipes - General	Submit compliance certificates	5 working days before ordering	Authorised Person
31.2	Other types of subsurface drainage pipes - Alternatives	Submit details of proposed alternative pipes and evidence of conformity for approval.	5 working days before ordering	Authorised Person
31.3	Geotextile - Properties	NATA compliance certificates, sample and manufacturer's instructions.	5 working days before ordering	Authorised Person

Table 3I-2 Witness point table

Item	Clause title	Requirement	Notice for inspection
Execution			
31.1	Site Establishment - Excavation	Unsuitable material removal and disposal to <i>MITS 02B Bulk earthworks</i>	Progressive
31.2	Site Establishment - Excavation	Spoil site locations to <i>MITS 02B Bulk earthworks</i>	Prior to placement

1.2 Materials

1.2.1 Subsurface drainage pipes

1.2.1.1 General

Approval: Before providing pipes, submit compliance certificate and test results determined from AS 2439.1 as evidence that the pipes, including connections to structures, conform to the requirements of this Specification.

This is a **HOLD POINT**.

1.2.1.2 Corrugated circular plastic pipe and fittings

Pipe: Conform to the following:

- > Standard: To AS 2439.1.
- > Class: 1000, 100mm diameter as shown on the drawings.
- > Type: Slotted, except where shown otherwise on the drawings.

Fittings: Provide joints, couplings, elbows, tees and caps as follows:

- > To AS 2439.1.
- > To the manufacturer's recommendations.

1.2.1.3 Solid walled uPVC subsoil pipes

General: Provide subsoil pipes without slots and otherwise complying to this Specification for connection to flushing points.

1.2.2 Other types of subsurface drainage pipes

1.2.2.1 Alternatives

Approval: Perforated or slotted pipes of other materials including uPVC and FRC may be accepted as an alternative subject to compliance with this Specification. Submit full details of the type of pipe, certification from the manufacturer of its suitability and quality for use in each particular application. Address the crushing strength, flexural strength, jointing system and slotting details.

This is a **HOLD POINT**.

1.2.3 Filter material

1.2.3.1 General

Quality: Clean, hard, tough, durable particles.

Where subsoil drains are laid in or adjacent to planted areas: Ensure the PH of the filter material is within the range 6 – 7.

1.2.3.2 Type A filter material

Source: Crushed rock or granular material.

Grading: To the **Type A filter material table**.

Use: In trench drains and Type B drainage mats: To *MITS 03K Drainage mats*.

Table 3I-3 Type A filter material table

Test method	Property Material passing AS sieve	Requirement % by mass
AS 1141.11.1	6.7 mm	100
	4.75 mm	85 to 100
	2.36 mm	0 to 40
	1.18 mm	0 to 5
	425 μ m	0 to 2

1.2.3.3 Type B filter material

Source: Granular material.

Grading: To the **Type B filter material table**.

Coefficient of saturated permeability: At least 8m / day after three hours of flow when compacted to its maximum dry density in conformance with AS 1289.5.5.1 and then tested to conform to ASTM D2434 68.

Grading variation as a result of compaction processes: To the **Type B filter material variation table**.

Use: In trench drains and Type A drainage mats: To *MITS 03K Drainage mats*.

Table 3I-4 Type B filter material table

Test Method	Property Material passing AS sieve	Requirement % by mass
AS 1141.11.1	4.75 mm	100
	2.36 mm	95 to 100
	425 μ m	20 to 80
	300 μ m	0 to 30
	150 μ m	0 to 2
	75 μ m	0 to 0.1

Table 3I-5 Type B filter material variation table

AS Sieve	Variation from grading before treatment (% of mass)
2.36 mm	± 3
1.18 mm	± 1
425 μ m	± 1
300 μ m	± 1
150 μ m	± 0.5
75 μ m	± 0.1

1.2.3.4 Type C filter material

Source: Crushed rock.

Grading: To the **Type C filter material table**.

Use: In Type A drainage mats: To *MIT S 03K Drainage mats*.

Table 3I-6 Type C filter material table

Test Method	Property	Requirement
AS 1141.11.1	Maximum particle size	37.5 mm
	Maximum passing the 9.5 mm AS Sieve	5% by mass
	Maximum (D90:D10)* or (see Note)	3
AS 1141.22	Minimum wet strength	100 kN
	Maximum 10% fines wet/dry variation	30%

Note: The D90 value is determined by sieving the material using 75mm, 53mm, 37.5mm, 26.5mm, 19mm, 13.2mm and 9.5mm AS sieves, as appropriate, and then plotting the results on a graph of AS sieve size v percentage passing. The plotted points to be joined by straight lines and the D90 value determined as the theoretical sieve size corresponding to 90% passing.

D10 denotes the theoretical size of a sieve through which 10% of the material would pass and is to be determined from the same graph used to determine the D90 value.

1.2.3.5 Type D filter material

Source: Uncrushed river gravel.

Description: Rounded aggregate to *AS 2758.1 Table B1 Appendix B*.

Grading: To the **Type D filter material table**.

Use: In Type A and Type B drainage mats: To *MIT S 03K Drainage mats*.

Table 3I-7 Type D filter material table

Test Method	Property	Requirement
AS 1141.11.1	Maximum particle size	75 mm
	Maximum passing the 9.5 mm AS sieve	5% by mass
	Maximum (D90 : D10)	3
AS 1141.22	Minimum wet strength	100 kN
	Maximum 10% fines wet/dry variation	30%

1.2.3.6 Type E filter material

General: Type E filter material shall be used in subsoil drains within planting beds and playground softfall areas where nominated on the Drawings.

Requirement: Where subsoil drains are laid in or adjacent to planted areas, ensure the pH of the filter material is within the range 6 – 7.

Source: Clean washed drainage sand

Grading: To the **Type E filter material table**.

Table 3I-8 Type E filter material table

Test Method	Property Material passing AS sieve	Requirement % by mass
AS 1141.11.1	9.5mm	100
	4.75 mm	98 to 100
	2.36 mm	70 to 100
	1.18mm	30 to 78
	600 \square m	2 to 15
	300 \square m	0 to 4
	150 \square m	0 to 1

1.2.3.7 No fines concrete

Use: Where specified on the Drawings.

Material properties: Conform to the following:

- > Aggregate to cement ratio: between 6:1 and 8:1 by mass.
- > Water to cement ratio: 0.35 to 0.45 by mass.
- > Shape: Minimum 98% by mass of aggregate with one fractured face.

Grading: To the **No fines concrete filter material table**.

Table 3I-9 No fines concrete filter material table

Test Method	Property Material passing AS sieve	Requirement % by mass
AS 1141.11.1	26.5 mm	100
	19.0 mm	95 to 100
	9.5 mm	0 to 5

1.2.4 Geotextile

1.2.4.1 Properties

Type: As shown on the Drawings.

Geotextile materials for curtain drains: Polyester, polypropylene or polyethylene.

Minimum material properties: Filter fabric shall be a non woven type with the following properties:

- > Elongation: $\geq 30\%$ to *AS3706.4*
- > Grab Strength: $> 500\text{N}$ to *AS 2001.2.3 Method B*
- > Tear Strength: $> 180\text{N}$ to *AS 3706.3*.
- > Filtration: To *AGPT04G Table 4.1* flow rate ≥ 50 litres/m²/second and permittivity ≥ 0.5 / second to *AS 3706.9*.

Submit: For approval the proposed geotextile material and NATA certificates of compliance. Submit a sample of the fabric, the manufacturer information and installation instructions.

This is a **HOLD POINT**.

Classification: Properties, functions, design and construction requirements to *AGPT04G*.

Specification: Material type and minimum mass requirements as shown on the Drawings.

Quality: Free of any flaws, stabilised against UV radiation, rot proof, chemically stable, low water absorbency. Filaments must resist delamination and maintain their relative dimensional stability.

Robustness and strength: Conform to the following:

- > Classifications for robustness and strength cited in *AGPT04G*.
- > Select material based on tests and subgrade conditions for the relevant location/function.
- > Rate of water flow: under 100mm constant head determined using the perpendicular flow test to conform to *AS 3706.9*.

1.2.4.2 Storage

Storage: Under protective cover or wrapped with a waterproof, opaque UV protective sheeting to avoid any damage prior to installation. Store to conform to manufacturers recommendations.

Damage: Must not be stored directly on the ground or in any manner that adversely affect the material by heat, dirt or damage.

Label: Make sure the geotextile material is clearly labelled showing manufacturer, type and batch number.

1.2.4.3 Seamless tubular filter fabric

Material: Either polypropylene or polyester seamless knitted tubular filter fabric.

Arrangement: Enclose slotted pipe 100mm diameter.

Properties: Free of imperfections in weave or yarn, abrasion resistance and weave stability qualities such that it does not form holes, ladder, de-weave, tear or unravel more than 5mm from a cut end.

Representative large opening size: Between 200 and 500 μm .

Damaged filter fabric: Remove and replace filter fabric that is torn, excessively stretched or otherwise damaged during transportation, storage, fitting of the fabric or pipe laying.

1.3 Execution

1.3.1 Provision for traffic

1.3.1.1 General

Requirement: Conform to *MITS 01 Traffic Management*.

1.3.2 Site establishment

1.3.2.1 Survey

Requirement: Confirm site surface and benchmarks. Conform to *MITS 00 Preliminaries*.

1.3.2.2 General

Excavation: Conform to *MITS 03A Trenching for underground services* and *MITS 02B Bulk Earthworks*.

1.3.2.3 Excavation

Over-excavation: If the trench is excavated below the documented level, backfill the trench to the documented level with non-porous subgrade material compacted to a relative compaction of at least 95% Standard compaction as determined by *AS 1289.5.4.1*.

Unsuitable material: Notify the Authorised Person of any unsuitable material and seek a direction for removal. Dispose of the unsuitable material as approved or directed. Replace unsuitable material to *MITS 03A Trenching for underground services*.

This is a **WITNESS POINT**.

1.3.2.4 Backfilling

Backfill: To *MITS 03J Subsoil and foundation drains* or *MITS 03K Drainage mats*. Stockpile and handle filter material to prevent contamination.

Compaction: Compact cohesionless material to a Density Index of 70% determined by *AS 1289.5.6.1*.

1.3.3 Outlet structures

1.3.3.1 Discharge

Subsurface drainage pipes: Connect discharge into sumps or to outlet structures. The outlet of the subsurface drain shall not be lower than the highest obvert of other pipes at the point of connection.

- > Where discharge is to the surface or an open drain, construct an endwall as detailed.
- > Where discharge is to drainage structures provide 100mm diameter uPVC pipe sleeving through the penetration.

Outlet intervals: 150m maximum

Rodent proofing: Secure outlets, including those discharging into sumps, with galvanized wire netting.

1.3.3.2 Outlet pipe

Type: Provide unslotted outlet pipes from subsurface drains.

Levels: Ensure no point in an outlet pipe is higher than the pipe at the end of the curtain drain.

Concrete for outlet structures: Concrete to conform to *MITS 10 Concrete works*.

1.4 Completion

1.4.1 Submissions

Work as Executed Records: To *MITS 00B Quality Requirements*.

2 MEASUREMENT AND PAYMENT

2.1 Measurement

2.1.1.1 General

Payments made to the Bill of Quantities: To *MITS 00A General requirements*, this Specification, the drawings and **Pay items**.

2.1.1.2 Methodology

The following methodology will be applied for measurement and payment:

- > Allow for all work, materials, testing and quality assurance requirements in each Pay Item.
- > Temporary erosion and sedimentation control measures: To *MITS 00C Control of erosion and sedimentation*.
- > Removal of unsuitable material: To conform to *MITS 03A Trenching for underground services*.
- > Subsoil drains: To *MITS 03J Subsoil and foundation drains*.
- > Drainage mats: To *MITS 03K Drainage mats*.
- > Subsurface drainage for Ponds, Wetlands and Bioretention systems: To *MITS 16 WSUD Features*.
- > Endwall outlet structures: Paid under this Specification.
- > Concrete work for outlet structures: Paid under this Specification and not *MITS 10 Concrete works*.

2.2 Pay items

Table 3I-10 Pay items table

Item No	Pay items	Unit of measurement	Schedule of rates scope
31.1	Filter material for trench drains (Type A, B, E)	Linear metre of subsoil pipe installed measured along the centreline	All activities extra over Subsoil drains associated with supply, placement and compaction of filtration and capping materials.
31.2	Filter material for Type A drainage mats (Type B, C, D)	m ² of drainage blanket constructed.	All activities extra over Drainage mats associated with supply, placement and compaction of filtration material.
31.3	No fines concrete capping for trench drains	Linear metre of subsoil pipe installed measured along the centreline	All activities extra over Subsoil drains associated with supply and placement of no fines concrete, including formwork.
31.4	Endwall outlet structures for subsurface drainage pipes	Number	All activities associated with the construction of outlet structures for subsurface drainage pipe including excavation in all types of material encountered including rock, supply and installation of outlets, concrete formwork, supply, placement, curing and finish of insitu concrete, vermin protection, connection to subsurface drainage and backfill.
31.5	Outlet to stormwater structures	Number	All activities associated with the construction of the outlet connection to stormwater structures, including excavation in all types of material encountered including rock, connection to stormwater structures and subsurface drainage, vermin protection, backfilling and making good of all works.



Transport Canberra and
City Services

July 2019